REMARKS

Applicants respectfully request reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow. This amendment adds, changes and/or deletes claims in this application. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claim(s) remain under examination in the application, is presented, with an appropriate defined status identifier.

I. Introduction

Claims 72, 81 and 83-88 have been cancelled without prejudice or disclaimer. Applicants reserve the right to present the non-elected cancelled claims 84-88 in a divisional application. Claims 69, 70 and 79 have been amended. Specifically, claim 69 has been amended to incorporate the limitations of amended claim 70, and claim 79 has been amended to incorporate the limitations of cancelled claim 81. New claims 89-92 are added. Support for the new claims may be found throughout the application, such as for example in Figures 1A-1C and pages 13-15 of the specification. After amending the claims as set forth above, claims 69-71, 73-80, 82 and 89-92 are now pending in this application. No new matter was added.

II. Interview Summary

Applicants appreciate the courtesy extended by the Examiner in conducting a telephone interview with the undersigned representative on August 24, 2007. During the telephone interview, applicants proposed inserting the term "uninterrupted" from claims 72 and 83 before the term "nanotube" in independent claims 69 and 79. The examiner suggested that another similar word be used instead. As requested by the examiner, claims 69 and 79 have been amended to recite "individual" nanotubes, as provided on page 19, line 22 of the specification.

The examiner also requested that the specific devices in claim 79 be expressly recited in the claim. In response, claim 79 has been amended to recite that the devices are diodes or transistors, as provided on page 2, line 7 of the specification.

The following differences between the claims and the prior art were also discussed. A possibility of submitting a declaration from an expert in the art was also discussed.

III. 35 U.S.C. §112 Rejections Should Be Withdrawn

Claim 70 is rejected under §112 as being indefinite for reciting a broader length-range than was recited in claim 69, from which claim 70 depends. Applicants have amended claims 69 and 70 such that the broader length-range is now found in the limitations of claim 69. Accordingly, this rejection is respectfully traversed.

IV. Claim Objections

Claim 74 is objected to because it recites a nanotube that comprises one of a plurality of substantially aligned carbon nanotubes. Contrary to The Examiner's interpretation of this claim as a "nanotube [that] comprise[s] a plurality of nanotubes," the scope of this claim is limited to an individual single nanotube within a plurality of nanotubes, rather than to the plurality of nanotubes itself. In other words, claim 74 recites that the nanotube of claim 69 is one of a plurality of nanotubes. Accordingly, this objection is respectfully traversed.

V. 35 U.S.C. § 102(b) Rejections Should Be Withdrawn

Claims 69-75 and 77-83 are rejected under 35 U.S.C. 102(b) as being anticipated by Zhu (Science 3 May 2002 Vol. 296). This rejection is respectfully traversed.

Claims 72, 81 and 83, which recite specific nanotube length and sidewall characteristics are cancelled to simplify the issues remaining in the present application. Thus, the rejection of claims 72, 81 and 83 is rendered moot.

A. Claims 69 and 79

Claims 69 and 79 are the only independent claims that are currently pending in this application. Claim 69 of the present application recites an individual single-walled carbon nanotube synthesized on a substrate, wherein the nanotube has a length of at least 1 mm.

Claim 79 recites a system comprising the nanotube described in claim 69, with multiple devices along the length of the nanotube.

Applicants submit that the Zhu reference does not teach, suggest or enable an individual single-walled carbon nanotube (SWNT) synthesized on a substrate, wherein the nanotube has a length of at least 1 mm. Further, Applicants submit that the Zhu reference does not teach, suggest or enable a system comprising such a nanotube having a length of at least 1 mm with multiple devices along the length thereof.

B. The Zhu Reference

Zhu teaches the growth of "SWNT strands" with lengths of 10 or 20 cm and diameters of ~0.3 mm (page 84 and Fig. 1). These strands consist of thinner SWNT ropes, which in turn consist of well-aligned SWNT bundles composed of aligned SWNTs. The strands are synthesized by a floating catalyst CVD method in a vertical furnace. However, Zhu is silent about the length of the individual SWNTs in the strands, ropes and bundles.

C. The Claims are Patentable over the Zhu Reference

Zhu does not teach the limitations of claims 69 and 79. Specifically, Zhu does not teach the limitation of claims 69 and 79 wherein the nanotube is "an individual single-walled carbon nanotube" having "a length of at least 1 mm."

Zhu teaches the growth of long SWNT strands. While the Zhu reference provides macroscopic dimensions for these strands, it says nothing about the lengths of the individual SWNTs in the strands. Specifically, Figures 1, 2A, 3A and 3B of Zhu show the nanotube strands while Figures 2B and 2C show nanotube ropes. However, the Figures do not show individual SWNTs whose length can be calculated from the Figures or whose length is at least 1 mm.

Furthermore, the length of individual SWNTs of Zhu are not inherently 1 mm or longer for the following reasons.

1. Resistivity

Zhu reports that the resistivity of the strands is 5-7x 10^{-6} Ω·m (page 884, last column, last paragraph). This resistivity is much higher than an expected resistivity of a strand of continuous SWNT whose length extends from one end of the strand to the other end. A reasonable explanation for the lower reported resistivity is that the length of the individual SWNTs in the strand of Zhu is shorter than that of the strand.

2. Temperature dependence

Zhu reports on page 884, last column, last paragraph that the temperature dependence of the resistance exhibited an upturn at 90K as the temperature is reduced. This upturn is a signature of the conduction mechanism being one involving tube-to-tube hoping, implying that the conduction paths require that electrons hop across tube-tube junctions (in a phonon assisted process) to get from one end of the fiber to the other. If the strand of Zhu contained continuous SWNTs which extended from one end of the strand to the other, then the conduction mechanism would involve conduction along the length of the continuous SWNTs rather than hopping from one SWNT to another.

3. Young's Modulus

Zhu teaches that the strands have a much lower Young's modulus than that of a single SWNT. This difference in modulus can be explained if the strands of Zhu are composed of a number of much shorter SWNTs, and individual SWNTs do not extend the entire length of the strands. Specifically, page 885, last column, last paragraph of Zhu states that the "...Young's modulus estimates for these structures [i.e., the strands] from the direct tensile tests fall short of values expected for individual nanotubes...".

The Young's modulus of hexagonally close packed (10, 10) SWNTs should be ~650 GPa. Since Zhu reports that the strand density is 48% (page 885, last column, last paragraph), and the modulus scales with the cross-sectional area occupied, the strand's Young's modulus should be ~312 GPa if SWNTs ran the entire length of the strand.

In contrast, Zhu discloses a Young's modulus of 49 to 77 GPa which scales to only ~100 to 150 GPa if the 48% density is taken into account (sentence bridging pages 885 and 886 of Zhu). This value of ~100-150 GPa is less than half of the about 300 GPa value that Zhu would have obtained if nanotubes ran the entire length of the fiber. This difference between the Young's modulus of Zhu's strands and the known SWNT Young's modulus indicates that the strands of Zhu are made up of shorter SWNTs which do not extend the entire length of the strand.

Moreover, because the Zhu reference describes a floating catalyst method in a vertical furnace, rather than growth from a substrate as disclosed in the present application, there is no basis for a presumption that the strand contains any individual SWNT having a length greater than 1 mm.

Therefore, individual SWNTs having a length of at least 1 mm are not inherent in the strands of Zhu because SWNTs of such length do not necessarily have to be present in the strands of Zhu. (See MPEP 2112(IV) which states that "The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. *In re Rijckaert*, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993)... "To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.' " *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999).")

Accordingly, the invention as recited in claims 69 and 79 as amended should be in condition for allowance. Dependent claims 70-71, 73-75, 77-78, 80 and 82 should also be in condition for allowance by virtue of their dependence on allowable base claims 69 and 79.

D. Claims 89-92

Dependent claims 89 and 91 recite that a substrate supports at least one end of the nanotube. Dependent claims 90 and 92 recite that a metal catalyst nanoparticle is in contact with at least one end of the nanotube.

In contrast, the Zhu reference describes a floating catalyst method in a vertical furnace, rather than growth of nanotubes from a substrate using catalyst nanoparticles, as disclosed in the present application. Thus, the individual nanotubes in a strand of Zhu lie on their side when the strand is placed on a substrate. However, the individual nanotubes of Zhu are not supported on one end by the substrate. Furthermore, Zhu does not state that a catalyst nanoparticle is in contact with at least one end of the nanotube.

VI. 35 U.S.C. § 103 Rejections Should Be Withdrawn

Claims 73 and 76 are rejected under §103(a) as being unpatentable over Zhu (Science 3 May 2002 Vol. 296) in view of Lieber et al. (US 6,781,166 B2). This rejection is respectfully traversed. Zhu and Lieber do not teach an individual single-walled carbon nanotube synthesized on a substrate, wherein the nanotube has a length of at least 1 mm, as recited in claims 69 and 79.

VII. Conclusion

Applicants believe that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested. The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicants hereby petition for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

Date 11/30/07

By _____

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